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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/669,616	09/24/2003	Brian Miller	F101	5615

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EXAMINER	
MCDONALD, RODNEY GLENN	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 12/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/669,616	MILLER, BRIAN	
	Examiner	Art Unit	
	Rodney G. McDonald	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 4, 5, 12, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by US 2003/0138709 A1 to Burbank et al. (Burbank).

3. For claim 4, Applicant requires a method for removing a material covering an alignment mark on a substrate comprising directing a charged particle beam at the material covering an alignment mark and removing the material by charged particle beam sputtering without using an etch assisting gas. For claim 5, the charged particle beam is a focused ion beam.

4. Burbank discloses recovering alignment marks obscured by a layer (abstract) by directing a focused ion beam at the material and removing the material by sputter etching [0025].

5. For claim 12, Applicant requires the substrate to be a silicon wafer. Burbank uses a silicon dioxide substrate and hence, has a substrate that comprises silicon [0030].

6. For claim 13, Applicant requires the material covering the alignment mark to be a metal film. The material covering the alignment marks is a metal film [0028].

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-3 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burbank (US PGPUB 2003/0138709) in view of Shimizu (U.S. Pat. 6,440,615) and Ferranti et al. (US PGPUB 2001/0027917).

9. Burbank teach a method for removing material covering an alignment mark on a substrate [0025] comprising mounting a wafer on a platform 154 in a focused ion beam system (See Figs. 6, 7; [0023-0028]) and directing an ion beam at a material covering the alignment mark to remove material by ion beam sputtering. [0025]

10. The differences between Burbank and the present claims is the ion beam source having a non-liquid metal ion source (Claims 1, 24) is not discussed, the current of the ion beam being greater than 300 nanoamps (Claims 1, 24) is not discussed, directing the ion beam at an oblique angle to the substrate (Claims 1, 24) is not discussed, the use of a plasma ion source (Claim 2) is not discussed and the oblique angle being less than 80 degrees relative to a substrate surface normal (Claim 3) is not discussed.

11. Regarding the ion beam source being a non-liquid metal ion source, Burbank does not disclose the material of the ion beam. Thus, Burbank could utilize any

conventional ion beam known in the art of focused ion beam sputter etching. Shimizu discloses utilizing gallium, argon, silicon or the like ion beams for sputter etching. (Column 8 lines 33-34)

12. Regarding the current of the ion beam being greater than 300 nanoamps, Burbank recognize that a focused ion beam source can be utilized for removing material. (See Burbank discussed above) Ferranti disclose that a focus ion beam source can have an energy of 1-60 KeV for removing material. Therefore utilizing a beam current within Applicant's claimed range would be obvious using Ferranti's power requirements given that a focus ion beam can be used for etching.

13. Regarding the directing of an ion beam at an oblique angle to the substrate, Ferranti deflects an ion beam oblique to the surface of the substrate. [0020] Thus the deflection and hence the angle relative to the substrate surface normal, is dependent upon the pattern and is a result effective variable.

14. Regarding the use of a plasma ion source, Shimizu already discussed disclose argon as an ion beam source. Argon is a plasma ion source. (See Shimizu discussed above)

15. Regarding the oblique angle being less than 80 degrees relative to a substrate surface normal (Claim 3), Ferranti already disclose an oblique angle in Fig. 1 for the ion beam. It would therefore have been obvious to have utilized a deflection angle of between 40 and 80 degrees because it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

16. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Burbank et al. by utilizing an ion beam source having a non-liquid metal ion source and plasma ion source as taught by Shimizu and to have utilized a particular current of the ion beam being greater than 300 nanoamps and to have directed the ion beam at an oblique angle to the substrate as taught by Ferranti et al. because it allows for removing material.

17. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0138709 A1 to Burbank et al. (Burbank) in view of US 6,440,615 B1 to Shimizu.

18. For claim 6, Applicant requires the focused ion beam to be of noble gas ions. For claim 7, Applicant requires the focused ion beam to be an argon or krypton or xenon ion beam.

19. Burbank is described above, but does not disclose the material of the ion beam. Thus, Burbank could utilize any conventional ion beam known in the art of focused ion beam sputter etching.

20. Shimizu uses a focused ion beam to sputter etch material from a substrate and hence, is analogous art. Shimizu uses an argon ion beam as noted above.

21. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Burbank to utilize an argon ion beam as the focused ion beam because of the knowledge that argon ion beams are conventional in the art of focused ion beam sputter etching.

22. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0138709 A1 to Burbank et al. (Burbank) in view of US 2001/0027917 A1 to Ferranti et al. (Ferranti).

23. For claim 8, Applicant requires the beam to be directed at an angle relative to the surface of the substrate. For claim 9, the angle is 40-80 degrees. For claim 10, the beam current is 300-20000 nanoamps. For claim 11, the current is 1500-5000 nanoamps.

24. Burbank and Ferranti are described above. Ferranti discloses the beam to be at an angle and have the beam current.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Burbank to utilize the focused ion beam system of Ferranti because of the knowledge that it is a conventional focused ion beam system. By using Ferranti's system, the beam would be oblique and have an energy current as claimed by Applicant.

25. Claims 14, 15 and 18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burbank et al. (U.S. PGPUB 2003/0138709) in view of Ferranti (US PGPUB 2001/0027917).

26. Regarding claims 14, 23, Burbank teach in Fig. 7 an apparatus for removing material covering an alignment mark on a substrate. (Fig. 7; [0026-0030]) The apparatus includes a device 182 to load and unload the substrate. (Fig. 7; [0027]) The apparatus includes a device 172 to align and position the substrate. (Fig. 7; [0026]) The apparatus includes a charged particle beam system 152 for emitting a charged

particle beam. (See Fig. 7; [0025]) The apparatus includes an optical system 168 for focusing the charged particle beam. (See Fig. 7; [0025]) A controller 100 positions the substrate. (See Fig. 7)

27. Regarding claim 15, Burbank further teach utilizing a focused ion beam system (FIB). [0023; 0025]

28. Regarding claim 22, Burbank teach that a scanning electron microscope 150 can be used for aligning. [0026]

29. The differences between Burbank and the present claims is the computer controlled beam deflector to position the charged particle beam is not discussed (Claim 14, 23), a device to control the charged particle beam dose is not discussed (Claim 14, 23), the particle beam being directed at an oblique angle is not discussed (Claim 18), the particle beam being directed at an angle of between 40 and 80 degrees is not discussed (Claim 19), the current of the particle beam is not discussed (Claims 20, 21), and a computer memory in communication with the devices is not discussed (Claim 23).

30. Regarding the computer controlled beam deflector to position the charged particle beam of Claims 14, 23, Ferranti teach a computer controlled beam deflector 20 for deflect the beam.

31. Regarding a device to control the charged particle beam dose of Claims 14, 23, Burbank teach that the controller can control the removal depth of the obscuring layer. (Page 4 claim 17) Ferranti suggest the dosage required for removal. (See Ferranti et al. discussed above) It follows that the controller could control beam dosage because this effects removal rate.

32. Regarding the particle beam being directed at an angle (Claim 18), Ferranti et al. discussed above teach directing the particle beam at an oblique angle. (See Ferranti et al. discussed above)

33. Regarding the particle beam being direct at an angle of between 40 and 80 degrees (Claim 19), Ferranti already disclose an oblique angle in Fig. 1 for the ion beam. It would therefore have been obvious to have utilized a deflection angle of between 40 and 80 degrees because it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

34. Regarding the current of the particle beam (Claims 20, 21), Ferranti disclose that a focus ion beam source can have an energy of 1-60 KeV for removing material. Therefore utilizing a beam current within Applicant's claimed range would be obvious using Ferranti's power requirements given that a focus ion beam can be used for etching.

35. Regarding the computer in communication with devices and for carrying out instructions for removing the material covering the alignment mark (Claim 23), Burbank and Ferranti already establish a controller for controlling the devices and for performing the process. Therefore it would be obvious to utilize a computer to automate the apparatus because merely using a computer to automate a known process does not by itself impart nonobviousness to the invention. See In re Venner, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958). See also< Dann v. Johnston, 425 U.S. 219, 227-30, 189 USPQ257, 261 (1976).

36. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Burbank by utilizing a computer controlled beam deflector to position the charged particle beam, by utilizing a device to control the charged particle beam dose, by utilizing a particle beam directed at an oblique angle, by utilizing the particle beam being directed at an angle of between 40 and 80 degrees, by utilizing a particular current of the particle beam and utilizing a computer memory in communication with the devices as taught by Ferranti et al. because it allows for removing material from a substrate.

37. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burbank in view of Ferranti et al. as applied to claims 14, 15 and 18-23 above, and further in view of Shimizu (U.S. Pat. 6,440,615).

38. Shimizu is repairing masks (abstract) with a focused ion beam (col. 8, l. 28-33) and thus is analogous art with Burbank and Ferranti. Shimizu discloses that focused ion beam system repairing masks can use gallium, argon, silicon, or the like ion beams with the only difference being the sputtering rate (col. 8, l. 33-34). Thus, gallium and argon are art recognized equivalents.

39. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized an argon ion beam because of the knowledge that an argon ion beam is an art recognized equivalent to a gallium ion beam and because of the desire to repair at a different sputtering rate.

Response to Arguments

Applicant's arguments filed October 17, 2005 have been fully considered but they are not persuasive.

The drawing objections have been overcome.

In response to the argument that the Burbank reference fails to suggest utilizing an ion beam without using an etch assisting gas, it is argued that the Burbank reference teaches utilizing a focused ion beam for etching and does not mention utilizing an etch assistant gas with the ion beam. Therefore it is reasonable to conclude that only the ion beam is being utilized for etching. (See Burbank discussed above)

In response to the argument that the amended claims include limitations not in the claims, as set forth in the rejection above the amended claims have been addressed by the cited references to show the limitations now included in the amended claims.

In response to the argument that the references do not teach the beam current, it is argued that Ferranti teach an ion beam having an energy which of 1 to 60 KeV which would suggest the beam current of greater than 300 nanoamps since the energy of the beam is related to the amps available for sputter etching. (See Ferranti discussed above)

In response to the argument that Ferranti does not teach the ion beam directed at an oblique angle relative to the surface of the substrate, it is argued and as shown in Ferranti's Figure that the beam can have an oblique angle relative to the surface of the substrate. This is done by controlling the angle of deflection of the beam through the optics. (See Ferranti discussed above)

In response to the argument that there is no motivation to combine the references, it is argued that there is motivation to combine the references since all the references are concerned with etching a material with an ion beam.

This action will be made NON-FINAL based on the new formulation of rejections of claims 14-22. The combination of Burbank as the primary references in view of Ferranti as the secondary reference was not considered before with respect to those claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
December 6, 2005